Successfully Connecting a Vector Signal Analyzer (VGA) to a VGA to TV Converter

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ABSTRACT: In general, most instruments like oscilloscopes with built in VGA outputs can be easily connected to the Fermilab internal cable TV network with a VGA to TV converter. However, the Hewlett Packard Vector Signal Analyzer (VSA) is the exception to the rule — no current VGA to TV converter has been successful in converting its VGA signal to TV. In this note, I will show the reason why the VSA VGA signal is different and describe a simple circuit which will allow the VSA to successfully connect to a VGA to TV converter.

MOTIVATION

This little adventure started when I wanted to distribute the display from a Hewlett Packard Vector Signal Analyzer (VSA)[†] to the internal Fermilab cable network. I tried three different brands of VGA to TV converters and all of them failed. No picture could be seen on TV despite the fact that when a multisync monitor was connected directly to the VSA VGA output a perfect picture was seen.

I did a little bit of sleuthing and found the reason: the VGA output of the VSA is not what is commonly known as standard VGA which consisted of the following five signals: `R` (red), `G` (green), `B` (blue), `hsync` (horizonal synchronization) and `vsync` (vertical synchronization). Unlike standard VGA, the VSA VGA output instead consisted of only three signals: `R` (red), `Gs` (green with embedded horizontal and vertical synchronization signals) and `B` (blue). The missing `hsync` and `vsync` signals were the fundamental reasons why the VGA to TV converters failed.

So the obvious solution was to make standard VGA from the VSA VGA signals. The easiest way was to extract out the `hync` and `vsync` signals from the `Gs` signal. I had originally thought that this would be quite complicated but fortunately a quick search with Google found at least four different ICs which could do this. I chose an IC which was cheap and required a minimal number of external components. After this circuit was built and connected between the VSA VGA out and the VGA to TV converter, the VSA display could be distributed on the cable network.

[†] Note that the new VSAs made by Agilent does output somewhat standard VGA and so the circuit which I describe here does not apply.

THE CIRCUIT

The circuit shown in Figure 1 is based on the Intersil EL1883 Sync Separator with Horizontal Output IC available from Digikey for about $3. I use the voltage from pin 13 (this should have been the `hsync` signal if the VSA had standard VGA) of the VSA VGA output for power. I have measured this pin to be at 3.6 V earlier and because the EL1883 can take `Vcc` from 3 V to 7 V, this is sufficient for it to work. Note that for this circuit to function as a VSA VGA to standard VGA converter, the `hsync` signal must come from pin 5 of the EL1883 which is called `Burst(BST)` in the data sheet and not from pin 7 called `Hout(HO)`.

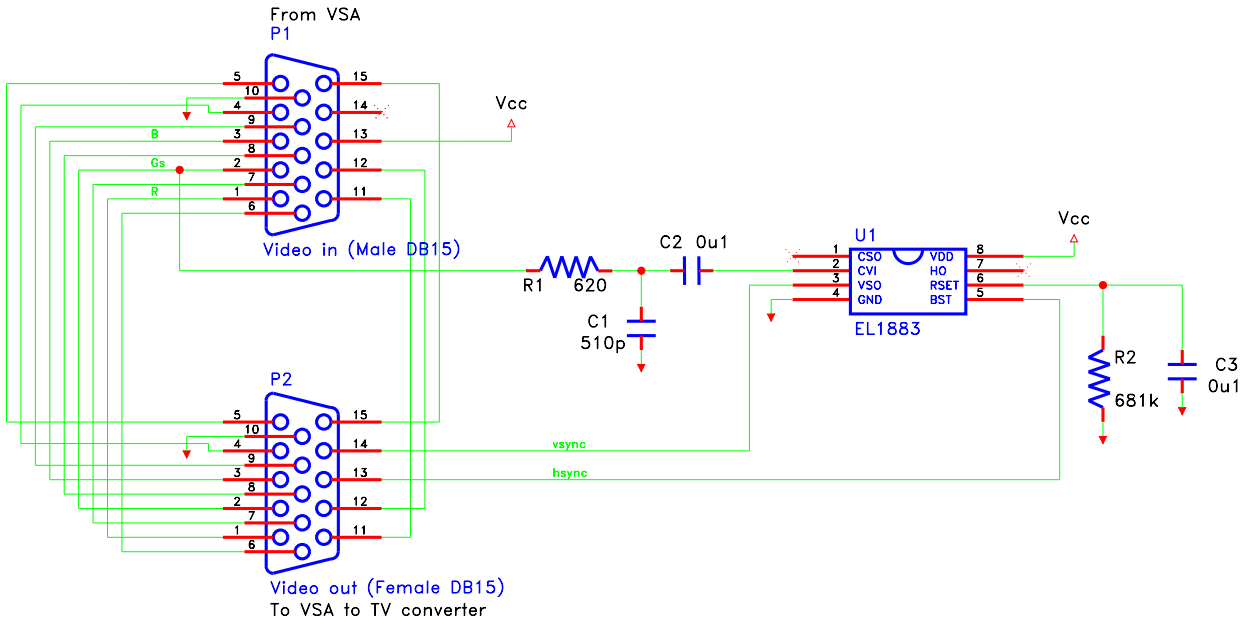

Figure 1 The synchronization extractor circuit.

RESULTS

The circuit shown in Figure 1 has been built and is shown in Figure 2. All the components are surface mount except for the DB15 high density connectors. The VSA VGA to standard VGA converter is plugged directly into the monitor output of the VSA shown in Figure 3. The output of the converter is connected to a VGA to TV converter (Averkey iMicro). The result is a spectacular success, the VSA display can be seen on a TV monitor. See Figure 4.

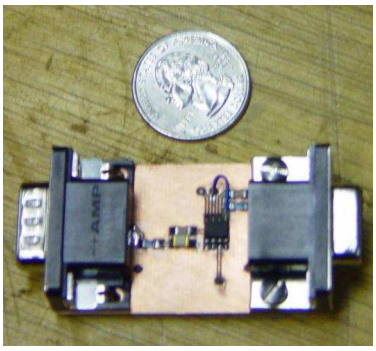

Figure 2 The circuit board of the VSA VGA to standard VGA converter.

ACKNOWLEDGEMENTS

I wish to thank K. Koch for quickly drawing up and building the circuit.

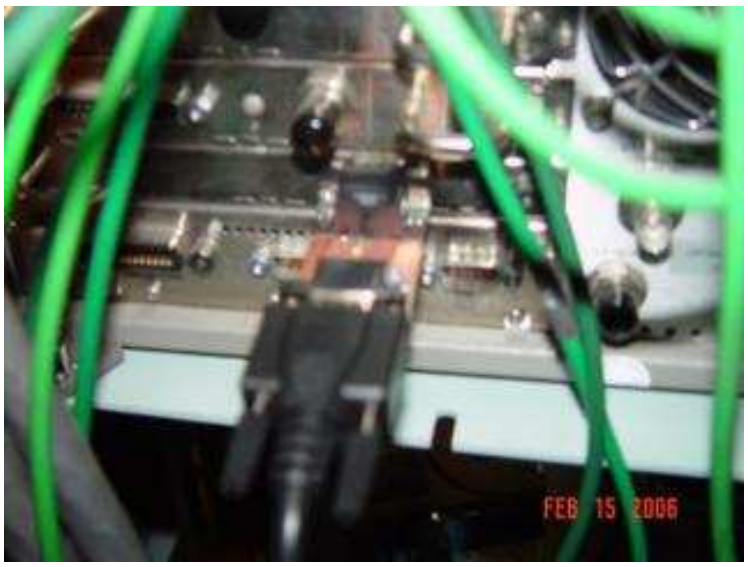

Figure 3 The VSA VGA to standard VGA converter sitting between the VGA out of the VSA and the cable leading to the VGA to TV converter.

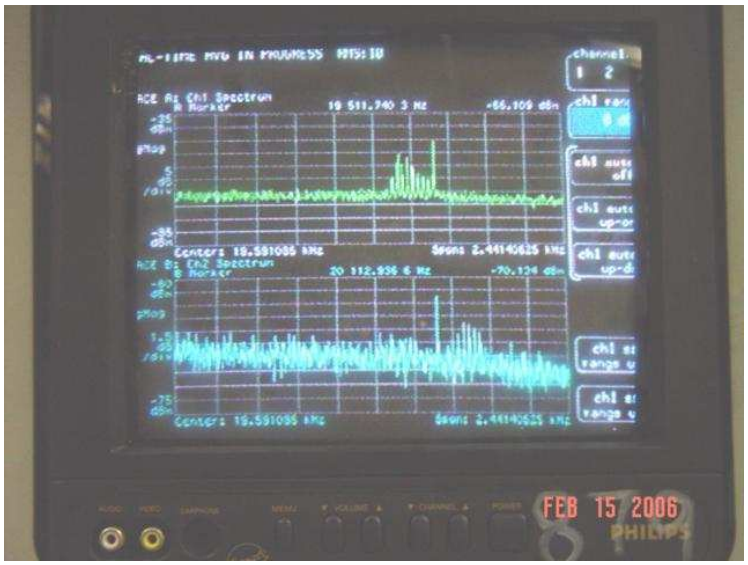

Figure 4 Success! The VSA display on a TV monitor.